EFFECT OF METAL CATIONS ON THE STABILITY OF COLLAGENOUS STRUCTURES IN VITRO

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Recent evidence suggests that calcium-ions stabilize collagenous structures also in soft connective tissues (Heikkinen, E. and Kulonen, E.: Scand. J. clin. Lab. Invest. 19, Suppl. 95, 40, 1967; Naber, E. et al.: Fed. Proc. 26, 121, 1967).

To study the maturation of collagen *in vitro* (Heikkinen, E. et al.: Acta physiol. scand. 68, Suppl. 277, 1966) L-proline-T(G) was injected intraperitoneally into newborn rats and after an interval of 4 h 0.1-mm slices were cut from cleaned skins and incubated under different conditions. Calcium ions in the incubation medium increased the radioactivities of the acid-soluble and insoluble collagen fractions about two-fold. Also the specific radioactivities of the α-components in acid-soluble collagen increased during incubations.

In 0.15 M Tris-buffer, pH 7.4, at +37°C the different metal cations (conc. 2.6 mM, as metal chlorides except Pb and Bi) promoted the formation of insoluble collagen in the following order: $Co^{2+} > Cu^{2+} > Cu^{+} > Au^{3+} > Ni^{2+} > Fe^{3+} > Cr^{3+} > Ca^{2+} > Fe^{2+} > Al^{3+} > Bi > Pb > Sn^{4+} > Sr^{2+} > Ba^{2+}, Mg^{2+}, Mn^{2+} > Li^{+}, K^{+}, Na^{+}$. In Krebs—Ringer phosphate a still larger effect was observed but the order of the metal cations tested was approximately the same.

Experiments with ^{45}Ca indicated that calcium-ions are bound to collagen in nondialysable form. The calcium content of skin collagen was about 20 moles/mole of tropocollagen varying with the age of the rat and the collagen fraction.

The cations may have a direct role in the strengthening of the stability of the collagenous structures in skin either by influencing the solubility of newly formed tropocollagen molecules or by promoting the interaction of collagen and the interfibrillar matrix.